

What is claimed is:

1           1.     An interface device for interfacing instruments to a simulation system to  
2     enable a user to interact with the simulation system to perform a medical procedure on a  
3     simulated anatomy of a virtual patient, said interface device comprising:  
4           a peripheral in the form of a mock medical instrument capable of selective  
5     manipulation by the user;  
6           an orifice for receiving said instrument;  
7           a guide tube for directing said instrument from said orifice into said interface device;  
8           a capture mechanism for engaging said instrument to enable said interface device to  
9     measure manipulation of and provide force feedback to said instrument; and  
10          a sensing assembly to measure manipulation of and provide force feedback to said  
11     instrument, wherein said sensing assembly includes:  
12           motion detection means to measure manipulation of said captured instrument  
13           and provide signals indicating said measured manipulation to said simulation system  
14           to simulate said medical procedure; and  
15           force application means to apply force feedback to said captured instrument in  
16     response to control signals from said simulation system.

1           2.     The device of claim 1 wherein said instrument includes an endoscope.

1           3.     The device of claim 1 wherein said instrument includes a nested instrument  
2     assembly, and said interface device further includes:  
3           a plurality of capture mechanisms each engaging a corresponding instrument  
4           of said instrument assembly to enable said interface device to measure manipulation  
5           of and provide force feedback to that instrument; and  
6           a plurality of sensing assemblies each measuring manipulation of and  
7     providing force feedback to said corresponding instrument.

1           4.     The device of claim 1 wherein said interface device further includes a pivoting  
2     mechanism to pivot said orifice.

1           5.     An interface device for interfacing instruments to a simulation system to  
2     enable a user to interact with the simulation system to perform a medical procedure on a  
3     simulated anatomy of a virtual patient, said interface device comprising:  
4             a plurality of peripherals in the form of mock medical instruments capable of selective  
5     manipulation by the user;  
6             a plurality of orifices for receiving said instruments;  
7             a plurality of guide tubes for directing said instruments from said orifices into said  
8     interface device;  
9             a plurality of capture mechanisms for engaging said instruments to enable said  
10    interface device to measure manipulation of and provide force feedback to said instruments;  
11    and  
12             a plurality of sensing assemblies to measure manipulation of and provide force  
13    feedback to said instruments, wherein each said sensing assembly includes:  
14                 motion detection means to measure manipulation of a corresponding captured  
15                 instrument and provide signals indicating said measured manipulation to said  
16                 simulation system to simulate said medical procedure; and  
17                 force application means to apply force feedback to said corresponding  
18                 captured instrument in response to control signals from said simulation system.

1           6.     The device of claim 5 wherein at least one of said instruments includes a nested  
2     instrument assembly.

1           7.     In an interface device for interfacing instruments to a simulation system to  
2     enable a user to interact with the simulation system to perform a medical procedure, a capture  
3     mechanism for engaging an instrument inserted within the interface device to enable the  
4     interface device to measure manipulation of and provide force feedback to that instrument,  
5     said capture mechanism comprising:  
6             a grasping member for engaging said instrument to enable said interface device to  
7     measure manipulation of and provide force feedback to said instrument; and  
8             an actuator for activating said grasping member to engage said instrument in response  
9     to user manipulation of said instrument.

1           8.     A method for interfacing instruments to a simulation system, via an interface  
2 device, to enable a user to interact with the simulation system to perform a medical procedure  
3 on a simulated anatomy of a virtual patient, said method comprising the steps of:

4           (a) inserting a peripheral in the form of a mock medical instrument into said interface  
5 device via an orifice and guide tube, and selectively manipulating said instrument within said  
6 interface device;

7           (b) engaging said instrument, via a capture mechanism, to enable said interface  
8 device to measure manipulation of and provide force feedback to said instrument;

9           (c) measuring manipulation of said captured instrument and providing signals  
10 indicating said measured manipulation to said simulation system to simulate said medical  
11 procedure; and

12           (d) applying force feedback to said captured instrument in response to control signals  
13 from said simulation system.

1           9.     The method of claim 8 wherein said instrument includes an endoscope.

1           10.    The method of claim 8 wherein said instrument includes a nested instrument  
2 assembly, and step (b) further includes:

3           (b.1) engaging each instrument of said instrument assembly to enable said  
4 interface device to measure manipulation of and provide force feedback to that  
5 instrument;

6           step (c) further includes:

7           (c.1) measuring manipulation of said each instrument and providing signals  
8 indicating said measured manipulation to said simulation system; and

9           step (d) further includes:

10           (d.1) applying force feedback to said each instrument in response to control  
11 signals from said simulation system.

1           11.    The method of claim 8 wherein step (a) further includes:

2           (a.1) pivoting said orifice to a desired orientation.